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FOREST SURVEY

NO. 2

JULY 15, 1935

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# ECONOMIC NOTES

PRELIMINARY STATISTICS AND ANALYSIS  
OF DATA OBTAINED FROM FOREST SURVEYS  
AND OTHER ECONOMIC STUDIES

BY THE

LAKE STATES FOREST  
EXPERIMENT STATION

UNIVERSITY FARM — ST. PAUL, MINNESOTA



FOREST SITUATION IN THE  
CLOQUET - SUPERIOR DISTRICT  
MINNESOTA

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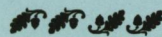
U. S. DEPARTMENT OF AGRICULTURE  
FOREST SERVICE

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PUBLICATION OF THE  
Lake States Forest Experiment Station\*

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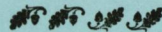


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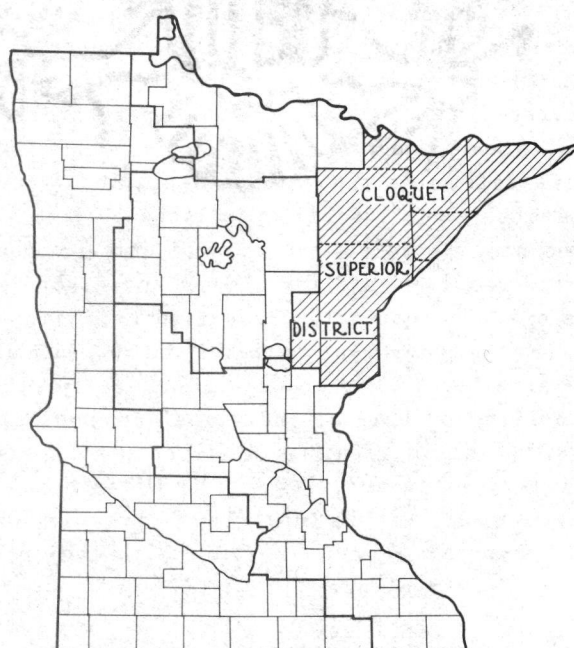
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\*Maintained by the U. S. Department of Agriculture, University Farm, St. Paul,  
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THE FOREST SITUATION  
IN THE CLOQUET-SUPERIOR DISTRICT  
MINNESOTA



ADVANCE FIGURES SUBJECT TO CORRECTION AND  
AMPLIFICATION IN FINAL REPORT



## FOREWORD

Fundamental to sound planning in either public or private forestry are reliable basic data on the local and the national timber situation.

From time to time, estimates have been made of the volume of timber left standing in the country, current rate of growth contrasted with the rate of depletion, and forecasts made of future timber needs. At no time, however, until the National Forest Survey was authorized by the McSweeney-McNary Act in 1928 was any systematic effort made to carry on a complete field survey to gather the needed information.

The present Forest Survey, which is now under way in most of the important forest regions of the country, is such a field survey. The five-fold aim of this survey is:

(1) Inventory. To take stock of the supply of timber and other forest products and the areas of land available for growing timber. This information is collected by natural economic units tributary to certain groups of wood-using industries. Ownership and availability of the timber are also considered.

(2) Growth. To ascertain the current rate of growth and the growth prospects under different types of management - mere protection, extensive management, and intensive management.

(3) Drain. To determine the rate of depletion from industrial and local timber use, windfall, fire, insects and disease.

(4) Requirements. To determine the present consumption and the probable future trend in the requirements for timber and other forest products.

(5) Conclusions. To correlate these findings with existing and anticipated economic conditions in order that policies can be formulated for the effective use of land available for forest production. Locally, this will often involve an analysis of the cutting budgets of individual companies and consideration of steps necessary to maintain economic units on a self-sustained basis.

The Forest Survey is an activity of the Division of Research, Forest Service, U.S. Department of Agriculture. The Minnesota Survey is conducted by the Lake States Forest Experiment Station with the co-operation of the Minnesota Department of Conservation.



## SURVEY FINDINGS IN BRIEF

1. The Cloquet - Superior economic unit adjacent to Duluth, Minnesota, embraces a gross land area of  $7\frac{1}{2}$  million acres of which 85 percent is forested. Most of the forest area has been cut-over or burned over at least once during the past three quarters of a century. However, all but 20 percent is restocking.

2. On superficial examination, the second growth forests of the unit seem adequate to support existing industries in perpetuity. The sawtimber stand of 4,267 million board feet is 30 times the current depletion of 138 million board feet. The 9.4 million cords of standing pulpwood is 90 times the annual consumption of local pulp mills. Current growth of 204 million board feet exceeds current depletion by a wide margin.

3. Closer examination of figures, however, discloses that the unit cannot become self-sustaining without some improvement of growing stock and some adjustments in industrial production. Much of the present volume and much of the present growth is in types and species not favored in commercial operations. There is poor geographical distribution of standing timber.

4. Nearly half of the sawtimber in the unit occurs as scattered trees on cut-over lands and thus is not available for immediate commercial operation. An additional share is of inferior species not widely used at the present time. Only one third of the total, or 1,470,300 M board feet, is pine in sawtimber stands.

5. If growing stock is to be maintained, not more than 8 million board feet in white and Norway pine types should be cut annually during the next 40 years. Present cut is about 18 million feet. On the other hand, the present cut of 10 million feet from the jack pine type and 25 million feet from aspen can be increased four fold without impairing the productiveness of the forest.

6. Forest conditions are widely different in the southern, central and northern divisions of the Cloquet - Superior District. The Southern division, embracing the territory surrounding Duluth and Cloquet, contains the greater part of the wood using industries, but the forest lands are badly depleted and are able to supply but a fraction of the needed pine sawtimber and spruce pulpwood.

7. The Central division, embracing the Iron Range and the lower North Shore territory below Little Marais, has less industrial development and considerably more timber. It supplies wood to Cloquet industries as well as exports pulpwood to out-of-state industries. But even here supplies of pine sawtimber and spruce and balsam pulpwood are inadequate to permit the present rate of depletion without impairing the growing stock.

8. The Northern division, embracing most of the Superior National Forest and several State forests, has abundant supplies of wood but practically nothing in the way of forest industries. It contains 86

percent of the white and Norway pine sawtimber, and three-fourths of all the pulpwood in the district. High logging and transportation costs are practical handicaps in marketing much of this material through existing industries.

9. The ownership of forests is in a somewhat unsettled condition. None of the operating plants have under their control a sufficient quantity of land and timber to assure sustained operation. Much of the land is tax delinquent and in process of reversion to the State. The tax situation is not conducive to private forest management.

10. In spite of these difficulties, the situation is promising for permanent maintenance of forest industries provided certain adjustments can be made. A logical long-time program should embrace:

- a) Curtailment in cut of white and Norway pine
- b) Expansion in use of jack pine, aspen, paper birch
- c) Coordination of ownership and management
- d) Better management of farm woodlots near Cloquet
- e) Expansion of public forests in Southern and Central divisions.
- f) Favoring Southern areas in expenditure of public funds for planting and intensive forest management
- g) Public cooperation with private owners in fire protection, forest credits, forest taxation and management plans.



## THE FOREST SITUATION

### IN THE CLOQUET-SUPERIOR DISTRICT - MINNESOTA

Duluth and Cloquet, at the head of Lake Superior, are in the center of a timber-producing territory which has in the past made notable contributions to the nation's softwood lumber supply and more recently has contributed generously to its increasing pulpwood demands. Embracing as it does the Superior National Forest, the largest public forest in the eastern United States, and at Cloquet an outstanding example of forest industry development, the territory is of unusual interest from the standpoint of forest management.

In common with most other pine and spruce areas in the Lake States, this territory has completed the first turn of the cycle of forest exploitation. Most of the accessible sawtimber stands have been cut and during recent years the cut-over lands nearest industrial centers have been worked over repeatedly for ties, fence-posts, fuel, pulpwood and low grade sawlogs. Fires and agricultural clearing have added to the depletion so that for the past two decades the productivity of the forest lands has been at lowest ebb. What the upswing of the cycle will bring will depend to a large extent on how the remaining timber and regrowth is managed.

#### Early Development

The story of forest development in the Cloquet-Superior District is typical of the pine-spruce areas of the Lake States. From a sluggish beginning in the 1840's, logging and lumbering in the pine forests began to assume large proportions in the Seventies with the completion of the Northern Pacific railroad to Duluth. In rapid succession, sawmills were erected at Duluth, Cloquet, Pine City, Hinckley, Carlton, Mission Creek, Moose Lake, Rutledge, Barnum, Mahtowa, Sandstone, Scanlon, Rock Creek, Atwood, and Nickerson. Duluth at one time was credited with 16 sawmills. As the southern area around Duluth and Cloquet became depleted, large scale operations opened up farther north. What was acclaimed to be the largest white pine mill in the world was built by the Virginia and Rainy Lake Company at Virginia in 1909. Winton, located some hundred miles north of Duluth, was also an important sawmill town in its day. Up to 1930 the aggregate cut of the mills in the District is estimated to have approached 16 billion board feet.

Rapid as was its development, even more rapid was the decline of the sawmill industry. Timber exhaustion began to be felt as early as 1900. By 1910, the end of the pine forests was definitely in sight. One after another the mills closed down, burned or were dismantled. The Duluth mills were among the first to be hit, and the contraction in lumber output there was rapid. The last Alger-Smith mill at Duluth was dismantled in 1920. Winton became a lumber ghost town in 1920, when the last of her sawmills ceased operations. The Virginia and Rainy Lake Company operated until 1929, when with a record cut of 2 billion feet for the 20-year period, it closed down.

## Present Industries

Most of the towns which figured in the early lumbering activities now have turned to other lines of development and no longer depend on the forests for a livelihood. Those of the southern area, Pine City, Hinckley, Moose Lake and Carlton are now primarily agricultural communities. The iron mines are, as always, the principal support of Virginia, Ely, and the other Range towns. Winton has been developing as an outfitting post for canoe trips and wilderness outings. Duluth has become the country's most important inland port.

Striking in its contrast to other sawmill towns is the present city of Cloquet. Like other mill towns of the district, it faced an imminent timber shortage when, in 1918, the town was wiped out by a forest fire. At this time there was serious question whether the remaining timber supply warranted the large investment which would be necessary to rebuild the town. However, a plan was developed looking toward the establishment of a group of mills capable of using the young growth and inferior species which appeared to be available in quantity. In line with this plan, one sawmill was renovated and another built, both adapted to the utilization of small logs. The paper mill was modernized, enlarged and equipped to handle jack pine and aspen as well as spruce. A crating and box factory capable of using 20 million feet of low-grade lumber was constructed. There was already a toothpick factory utilizing paper birch. A match factory using aspen and a large insulation plant utilizing low-grade bolts and mill waste rounded out the set-up.

About these industries there has developed an up-to-date town of almost 6,800 inhabitants. It supports four modern grade schools, a high school, 7 churches, a municipal water and sewage system, a public library, hospital, Y.M.C.A., and fraternal buildings. Approximately 25 million dollars have been invested in the industries, stores and residences of the town and in the railroads and timber lands which support it. Taxes are borne and public improvements paid for largely by the wood-using industries. In the face of the depression, employment has been maintained at a high level and relief needs have been held down.

Manufacturing, as they do, a wide variety of products which utilize many types of wood, the Cloquet industries seek wood supplies of all kinds throughout a broad territory and virtually dominate the timber markets of the entire region.\* Because they are so largely the focal point of woods activities, any analysis of the forest possibilities of the Cloquet-Superior District must be colored throughout by their influence.

## Three Divisions of Forest Area

In view of the differing forest stands and extent of development, the district should be divided into three distinct divisions.

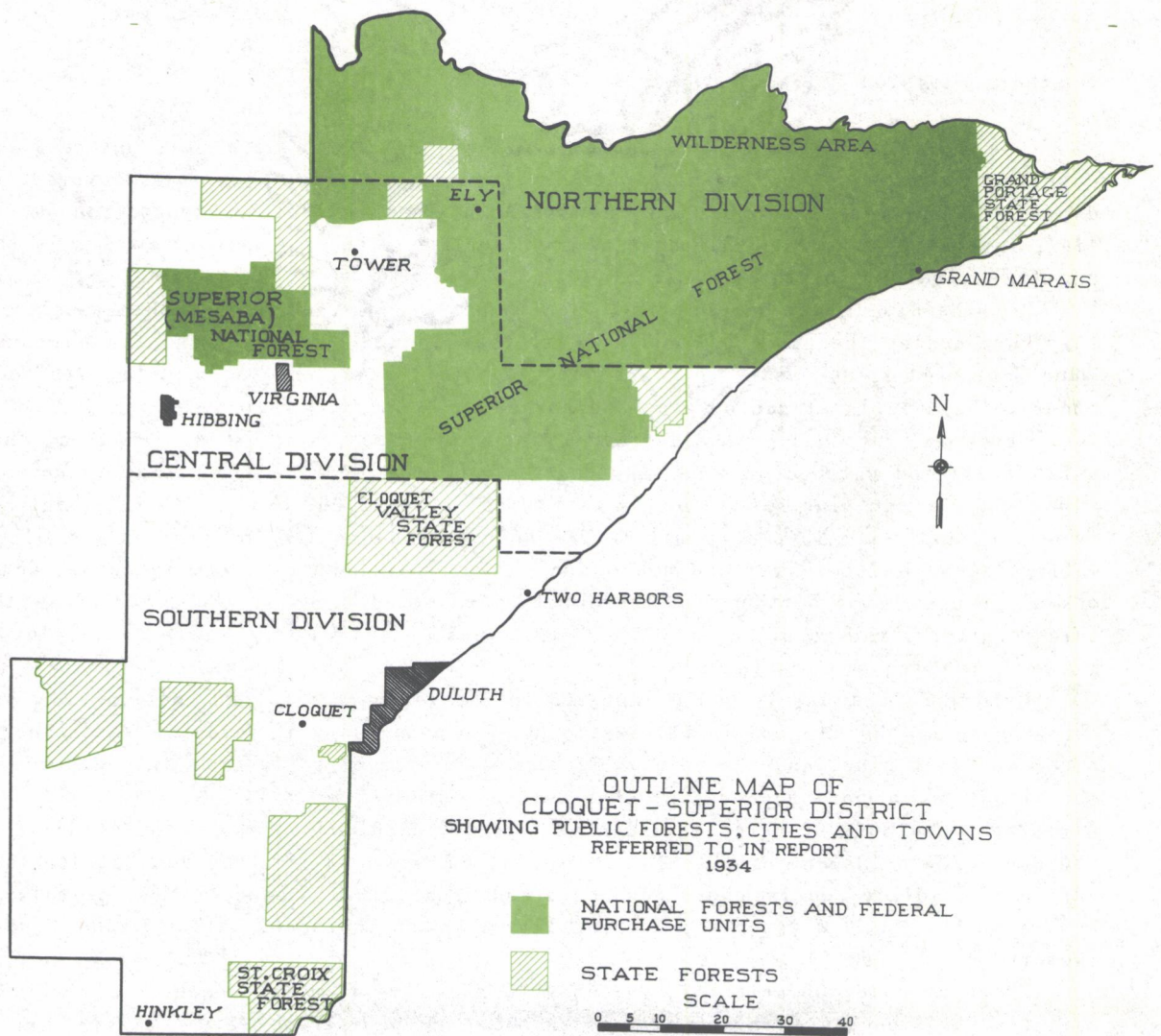
The first zone or division lies within a 40-60 mile radius of Cloquet, from which wood products can readily be trucked to the Cloquet market or hauled to

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\* In addition to the industries at Cloquet, there is still a fair-sized mill at Virginia cutting lumber principally for local consumption, and a small mill at Duluth cutting box lumber. There are over a hundred small mills scattered around over the district, each cutting a few thousand feet, mainly in the form of ties, boxwood and rough lumber.



# NORTHEASTERN MINNESOTA



Duluth and Superior for shipment into Wisconsin. It has been designated the southern division.

The next zone north, which falls within a 90-mile radius of Cloquet, has been designated the central division. It lies outside of the general trucking territory but timber is available to Duluth and Cloquet by rail over three common carriers and two logging railroads. The Mesabi and Vermilion iron ranges lie within this division.

The third zone, called the northern division, embraces the Superior National Forest and other lands along the Canadian border.

The diversity of conditions in these divisions has an important bearing upon the forest possibilities of the district and for this reason deserves comment.

### Southern Division

The southern division is characterized by high wood requirements but relative poverty in wood supplies. As a potentially productive forest area it is favored by dependable markets at Cloquet and in Wisconsin, by excellent transportation facilities, favorable logging conditions and a productive soil. The main drawback is the run-down condition of the forest.

At present, timber supplies for local needs are not adequate within this territory surrounding the principal mills. Both the Cloquet industries and the Wisconsin importers find it necessary to reach out into other areas and to compete with each other for available stands of pine and spruce.

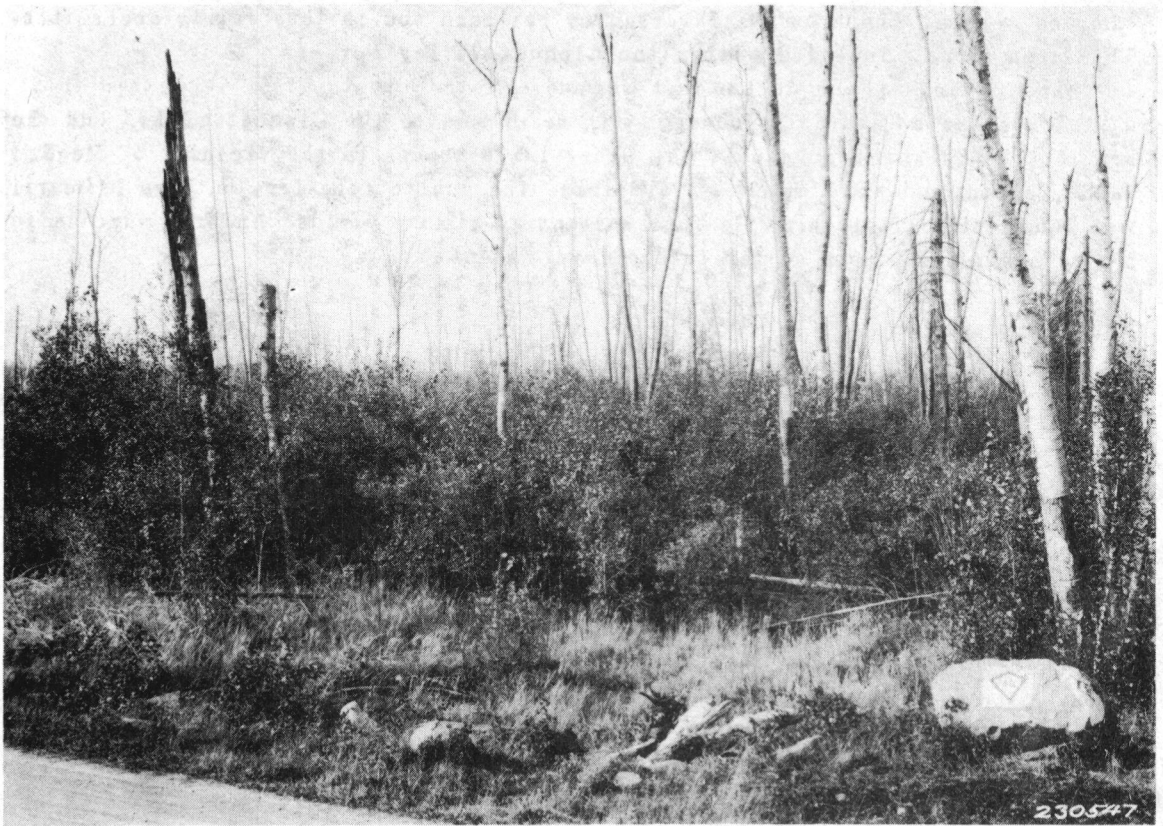
There is practically no old-growth pine left in the southern division and only a few scattered patches of pine second growth (See Figure 2). The total volume of white and Norway pine sawtimber is estimated to be 35,660 M board feet, about a two-year supply for the local mills. The once splendid stands of pine in the Cloquet valley, along Kettle River and near Sandy Lake, have been replaced by aspen, scrub oak and brush. Some of the most thoroughly devastated lands in the state lie within this territory, the result of such conflagrations as the Hinckley fire in 1894 and the Moose Lake-Cloquet fire in 1918.

Pulpwood likewise is badly depleted in the southern division, but in view of the ability of the Cloquet industries to use large amounts of inferior woods such as aspen and jack pine, and the relatively short time required to grow this material, the situation is more encouraging than for sawtimber.

There are 866,200 acres of aspen in this division and an estimated stand of 226,000 cords of aspen suitable for pulpwood, an amount more than adequate to take care of immediate requirements for paper and crude fiber products. Most of this aspen is of too small size or too poor quality to meet the needs of the Cloquet match factory.

There are 346,800 acres of coniferous swamp forest in the southern division, but as a result of poor growing conditions in some and poor treatment in others, the volume of spruce pulpwood amounts to only 80,000 cords, about a two-year supply for local mills. Much of the swamp land around Toivola, Meadowlands, Floodwood and Sandy Lake is inherently non-productive. Tamarack and spruce trees 100 years or more of age are still scraggly, stunted specimens, too small to make a respectable pulp stick. Altogether 50 percent of the quarter million acres of spruce swamp has been classified as definitely non-productive, and some other areas are relatively poor. Even on the better spruce lands there is a tendency to cut pulpwood too small. Many truck loads of spruce, three inches or less in diameter, are hauled into Cloquet by





Aspen and Brush On Recently Burned Land  
In Southern Division Near Duluth, Minnesota

farmers hard-pressed for cash income. Trees are felled when they are just beginning to put on appreciable growth.

The upland spruce-balsam forests have suffered from fires along with the pine, but are coming back somewhat more encouragingly. There are 288,000 cords of balsam pulpwood, with promise of increasing yields in the future.

The supply of jack pine pulpwood is inadequate in the southern area, there being at present only 108,000 cords.

Forest land in the southern division is predominantly in small private holdings. In favored localities, particularly around the larger towns, farm development has made steady advances but a considerable portion of the average farm is still wooded. Tentative zoning plans\* indicate that 50 percent of the area is adapted to farm purposes. The other 50 percent is too swampy, stony or unfavorably located for agriculture, and is better suited to forestry or game production.

Throughout the entire Cloquet-Superior district, large acreages of wild land are in process of reverting to State ownership because of tax delinquency. In several areas where delinquency is especially prevalent, State Forests have been established with the intention to devote the tax-reverted land to forest use. One of the most promising of these is in the Cloquet River valley in the

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\* Jesness, Oscar B. and Reynolds I. Nowell, *A Program of Land Use In Northern Minnesota*. 1935.

northeast corner of the southern division. This tract is naturally productive, has some residual sawtimber and pulpwood, and is restocking more or less to pine, balsam and popple. The area is traversed by railroad and is thus fairly accessible. This area is now included within the Cloquet Valley Forest.

The Savanna, Fond du Lac and Nemadji State Forests also lie within this division and are favorably located with reference to the Cloquet market but they are in a badly run down condition. Other large tracts in the vicinity of Meadowlands, Floodwood and Cotton are available for public forestry, but are primarily wet lands with little promise for substantial timber yields. An area surrounding McGrath has some promise for future development.

### Northern Division

In contrast with the highly developed southern division, the northernmost area has practically nothing in the way of industrial development, but is abundantly supplied with wood.

Over 86 percent of the white and Norway pine remaining in the entire district is concentrated in this northern division. Likewise, three fourths of all pulpwood is centered here. The condition of this northern area is a result partly of accident, partly the kind of management it has had, partly its inaccessibility.

The division lies entirely within public forests or purchase units - the Superior National Forest and the Pigeon River, Burntside and Minnesota State Forests. The Superior National Forest, when it was set aside from the public domain in 1909, consisted mainly of young jack pine and aspen which had come in following severe forest fires of the Sixties, and a few patches of old-growth pine and spruce considered too remote or scattered to be of any value for lumbering. The best of the pine had been alienated and eventually found its way into the hands of a half dozen or so large timber operators.

All of the privately owned old-growth pine which could be readily reached by water, rail or sleigh haul, was logged while the large mills were cutting at Virginia, Winton, Skibo, and Duluth. Logs from the Pigeon River in the north were even shipped to Canada and Wisconsin. The pine sawtimber which remains in large private ownership, about 640,000,000 board feet, is mainly in the extreme northern part of Cook and Lake counties where it can be taken out only at high cost.

Meanwhile, the areas in public ownership have developed markedly in the 70 years since they were burned and many stands are now of merchantable size. The State and Federal forests have received better protection than the lands farther south and there have been few serious conflagrations in recent years. As a result, some of the better species--balsam, spruce and Norway pine--are gradually coming in under the aspen and jack pine and promise increasing quality as well as quantity in the future yields.

One outstanding feature having considerable bearing upon the commercial possibilities of the northern area is the strip of rough and broken land along the Canadian border which is one of the few remaining wilderness areas in the eastern United States. It is an area of superlative scenic attraction, featuring large undeveloped lakes, canoe routes, virgin timber, and splendid fishing. Public lands within a short distance of the more remote lakes and canoe routes are reserved from cutting. The area embraced within the Shipstead-Newton-Nolan law within which cutting is prohibited, represents, however, only a very small percentage of





Fifty Year Old Aspen And Birch With Scattered Conifers  
In Northern Division  
Typical Forest In Wilderness Area Of Superior National Forest

the gross area. There is considerable agitation, backed by some sportsmen's and civic organizations, to bring a larger share of the private lands into public ownership and to reserve them from exploitation. To maintain recreational and scenic values through protection of the area from fires is of greatest importance.

#### Central Division

Conditions in the central division are intermediate between those in the south and in the north. There has been less destructive exploitation than in the territory immediately surrounding Duluth and Cloquet, but conditions have not favored the kind of forest regeneration which has taken place in the north.

The central division includes the Iron Range towns--Virginia, Hibbing, Eveleth, Chisholm, Tower and Ely, which for nearly 70 years have been drawing on the forest for building lumber and mine timbers. Many fires have been associated with the mining and early lumbering so that the range territory is largely devastated.

Duluth lumber companies early invaded the eastern part of this district and cleared away the pine. More recently, Wisconsin as well as local pulp mills have been drawing heavily upon it for spruce and balsam pulpwood. Considerable volumes are still being shipped from the territory.

There now remain 164,760,000 feet of pine sawtimber, nearly four times the amount in the southern district but only one twelfth of the amount in the north. Two thirds of this volume is jack pine.

There are 1,549,000 cords of pulpwood, double the amount in the south and one fifth the amount in the north. There is over four times as much jack pine and nearly three times as much spruce as in the southern area. There is a 50 per cent greater supply of balsam and aspen. Only in balsam does this division compare at all favorably with the northern area.

Land ownership in this division is in a state of flux. There is relatively little agricultural development so that ownership of land has been associated mainly with mining or lumbering. Land with mineral possibilities has been fairly well held but of course is rather limited in area. Timber land after being cut-over has commonly been abandoned by the owner.

State laws provide for reversion of tax delinquent land to State ownership, but, as a result of various stays and adjustments, no land has actually been taken by the State. One State Forest, the Finland, has been set up in the eastern part of the division to absorb reverting lands. Parts of the Burntside, Kabetogama and George Washington forests also extend into the area.

Within the past few years, the Federal Government has established two purchase units within the division. The Mesabi unit takes in the cut-over land on the north edge of the Iron Range. A new addition to the Superior Forest includes a large share of the forest land in the eastern part of the division. Purchases of land by the Federal Government have been proceeding rapidly.

Both Federal purchase units and State Forests are too new to have had any appreciable effect upon the timber supply situation. From now on it is reasonable to expect improvement in fire protection. Changes in cutting methods and management plans will depend upon how much and how rapidly the productive land is brought into public ownership.

### Location and Character of Industries

#### Sawmills

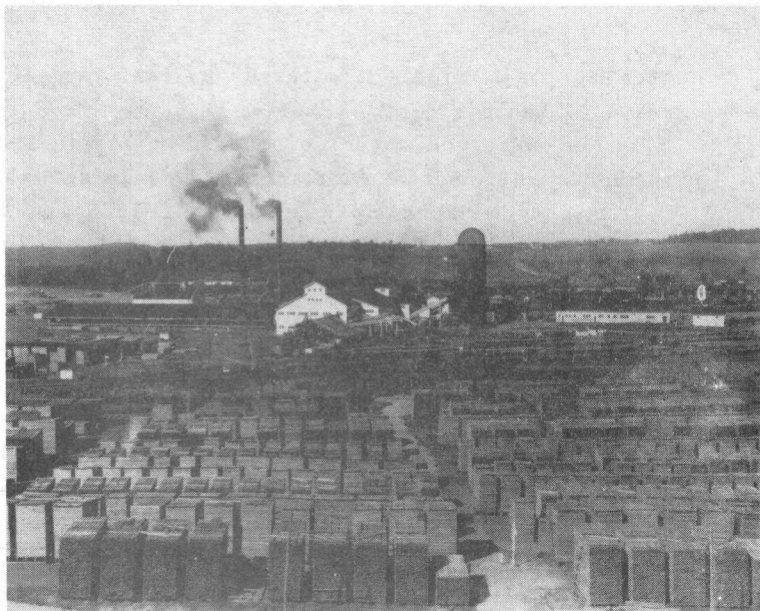
The largest sawmills in the district are those at Cloquet in the Southern division. Manufactures are principally rough lumber (white pine), pine flooring, boxes and crates from pine, aspen, spruce, balsam and basswood. About 30 percent of the lumber is used in Minnesota, 30 percent goes to Wisconsin and 40 percent farther east. Nearly 95 percent of box shooks and crate material is shipped out of the state. Two thirds of the logs come from private holdings in Cook county in the northern division, one third from St. Louis county and the Nett Lake Indian Reservation.

There are three other sawmills which in normal years produce between 5 and 10 million feet of lumber annually. One is at Duluth in the southern division; the other two are in the central division at Tower and Virginia. The principal product in each case is box lumber. Logs for the Tower and Virginia mills are purchased from farmers and jobbers within a 40-mile radius. Logs for the Duluth mill are purchased from jobbers near Haley and Cusson. A large share of the box lumber is shipped out of the state to Wisconsin, Illinois and Iowa.

In addition to the above larger mills, there are 151 small mills producing normally from 10 thousand to 5 million board feet of lumber per year. The majority of these are small portable plants cutting ties, lumber for fish boxes, crates,

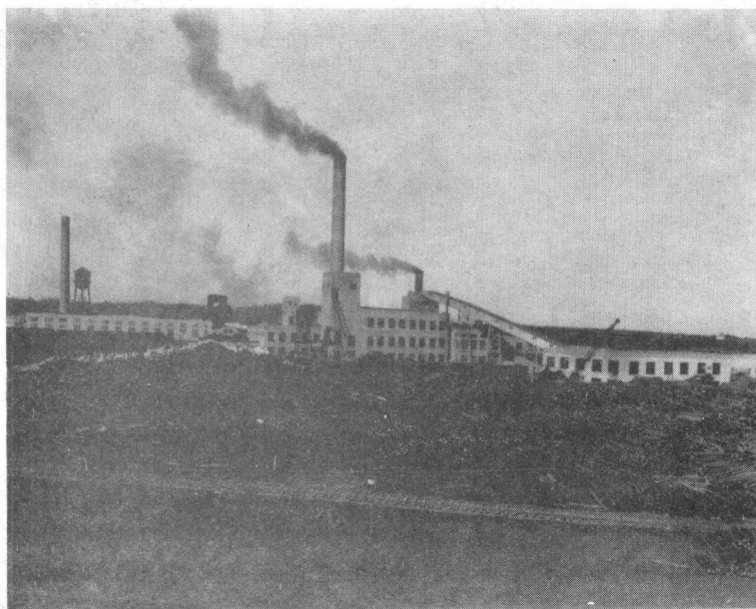


SAWMILL and LUMBER YARD  
CLOQUET -



MATCH and CLOTHE/PIN FACTORY  
CLOQUET -

PULP and PAPER MILL  
CLOQUET -



etc. They are widely scattered but fall largely within the southern and central parts of the district.

The combined output of 155 sawmills in 1933 was 44,808,000 board feet of lumber. Under more normal conditions an annual cut of about 76,109,000 board feet might be expected. (Table 2) In 1933 about 844 men were employed in the sawmills, a figure which will also doubtless increase in more normal times. (Table 1)

### Pulp Mills

Pulp mills are located at Cloquet in the southern division but wood is obtained also from the northern and central area and elsewhere in the state. Over 100,000 cords of wood were consumed in 1923 - 49 percent spruce, 23 percent aspen, 22 percent jack pine and 6 percent balsam. (Table 3) The bulk of the pulpwood is obtained from commercial operations but an increasing proportion is purchased from farmers and jobbers within a 40-60 mile radius. The mills manufacture pulp by the groundwood, sulphite, sulphate and sodite processes. They turn out a wide variety of products including newsprint, wrapping paper, fine papers, fiberboards and balsam wool. They effect very close utilization of pulpwood and make use of waste from nearby sawmills.

### Other Mills

There are two match factories in the district, both in the southern division. The factory at Duluth manufactures standard matches from western white pine imported from their Washington and Idaho mills. The Cloquet factory manufactures both safety and regular matches on an aspen stem. This factory also produces clothespins, paper plates and other specialties from spruce pulpwood, aspen and paper birch veneer bolts. Normal consumption is about 14,492 cords. In 1932 this company purchased 2,594,000 board feet of timber from local farmers for \$41,766. In 1933 it bought 5,207,000 board feet for \$33,532. In 1934 nearly 1,000 men were given employment in these industries at Cloquet.

There are 6 shingle mills and 5 lath mills in the Cloquet - Superior District but none are of any great size. Thirty-five men were employed in 1933. The combined output was 1,750,000 lath and 957,000 shingles.

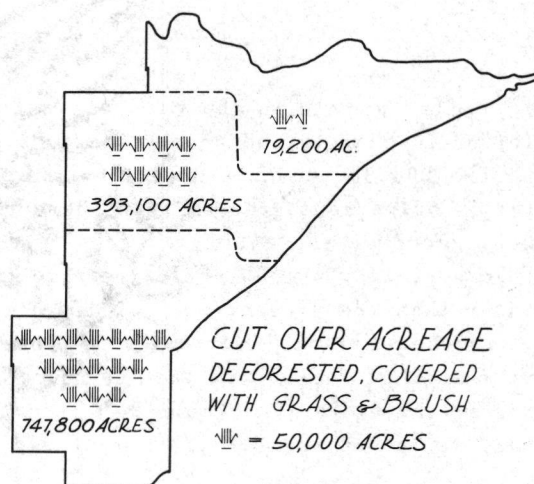
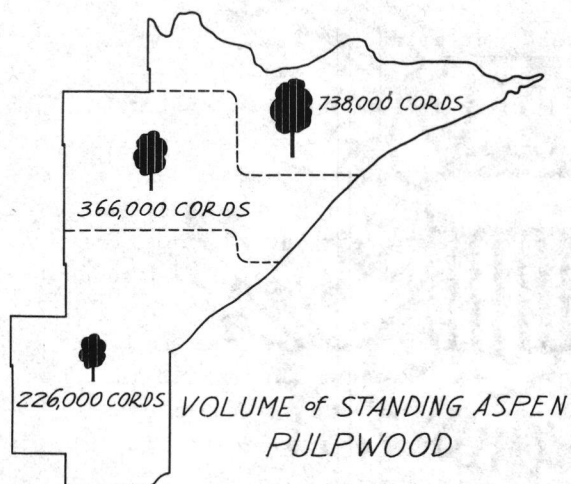
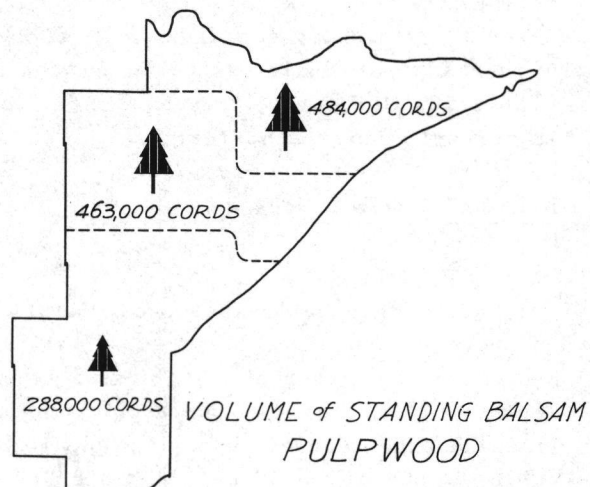
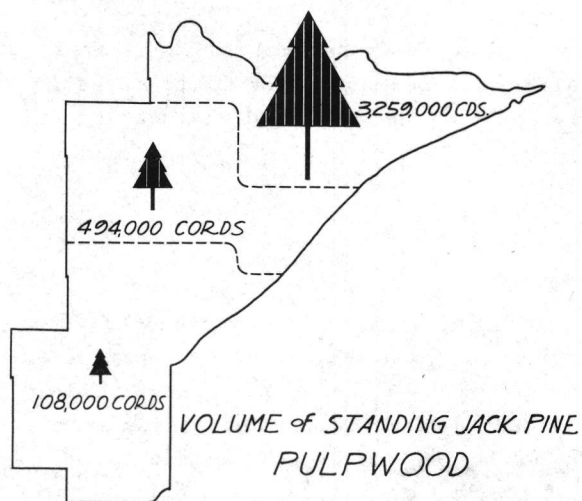
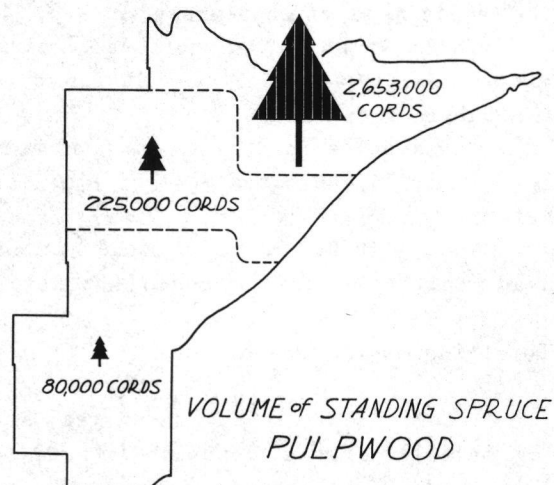
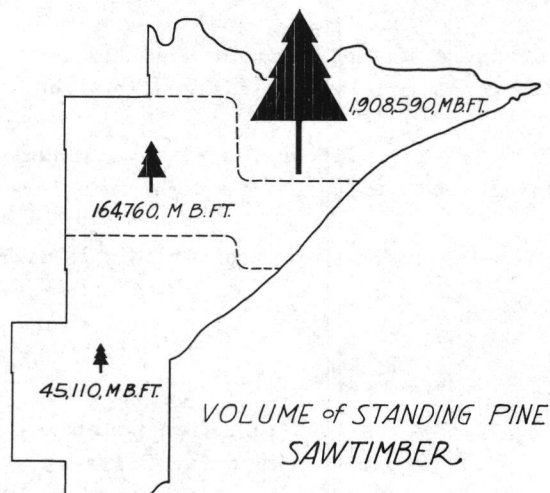
There are no cooperage or veneer mills in the district but limited quantities of logs are shipped out to mills elsewhere in the state.

### Mines

The iron mines on the Mesaba and Vermilion Ranges consumed large quantities of wood in the form of timbers, poles, lagging and ties. In 1933 over 5,000,000 feet of timbers, 10,000 cords of poles, 3,700 cords of lagging and 71,789 ties were used in the district. Normal requirements are estimated 33 1/3 percent greater than in 1933. Timbers are small logs 7 inches to 16 inches top diameter and 8 to 20 feet long of white pine, Norway pine, jack pine, spruce or tamarack. They sold for \$22 to \$24 per thousand board feet in 1933. Poles are smaller pieces 4 inches to 7 inches top diameter and 8 to 12 feet long. They are principally jack pine and tamarack and are worth about 1½ cents per lineal foot at the mine. Lagging is still smaller and poorer material; principally cedar, jack pine and tamarack, worth \$4 per cord. Oak, tamarack and pine ties are used.



# COMPARISON of VOLUME AND AREA IN DIFFERENT DIVISIONS IN CLOQUET - SUPERIOR DISTRICT



### Other Wood Uses

Normally about 46,000 cords of pulpwood are exported from the Cloquet - Superior District, largely to Wisconsin mills.

Around 384,000 fence posts are cut annually - cedar, jack pine and aspen being the woods most commonly used.

Normally 25,000 or more cedar poles are produced in the district - partly for export, partly for local use in farmer telephone lines and communication lines on the public forests.

Cabin poles for tourist camps, summer homes, ranger stations, etc. take annually around 275,000 board feet of pine, aspen, spruce and other conifers from the forests of the District.

About 140,000 cords of wood are cut annually for fuel. Over half of this is from dead, cull or otherwise unmerchantable trees.

### Total Industrial Drain

Altogether it is estimated that about 90,768,000 board feet of merchantable sawlog material are cut annually from the forests in the Cloquet - Superior District. (See Table 15) Of this total, 60,454,000 board feet or two-thirds are taken from the southern and central divisions and 30,314 board feet or one-third from the northern division.

In addition to sawtimber, about 13,394,000 cubic feet (roughly 186,000 cords) of merchantable material below sawlog size are removed annually from the forests. (Table 16) Of this 87 percent comes from the southern and central divisions and only 13 percent from the northern.

### Fire and Other Losses

Based upon past experience, fire losses amounting to a little over one half of one percent and other losses of a little less than one half of one percent may be expected in sawtimber stands. Losses in small trees will be somewhat greater. Total depletion, combining amounts cut for industrial and domestic uses and losses from fire and other causes is estimated at 137,697,000 board feet or, to include total cubic volume of wood, about 98,823,000 cubic feet (approximately 1,372,500 cords).

### Comparison of Growth and Depletion

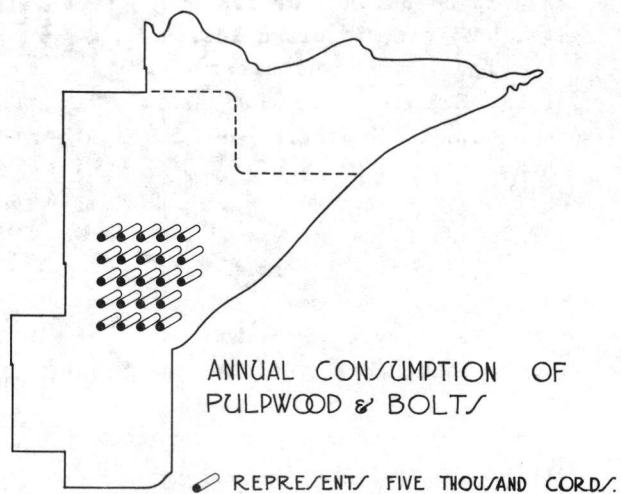
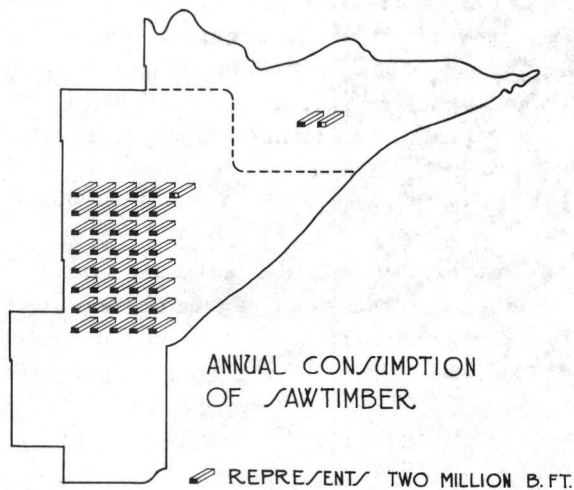
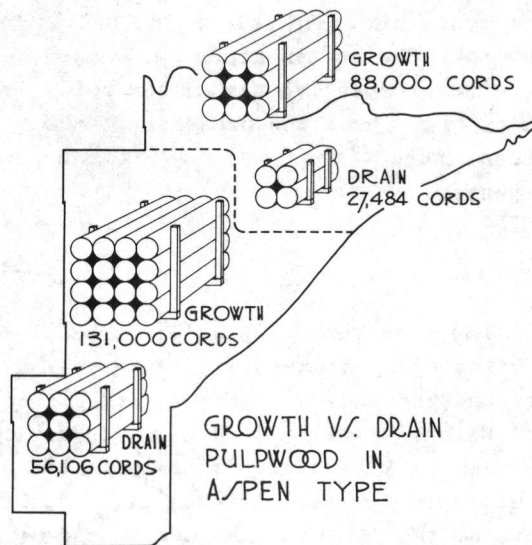
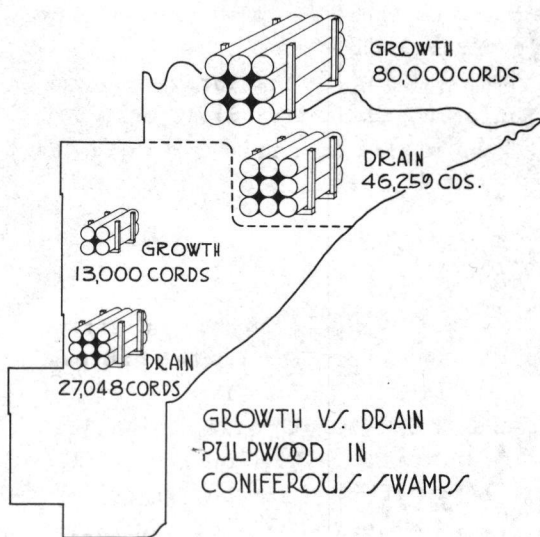
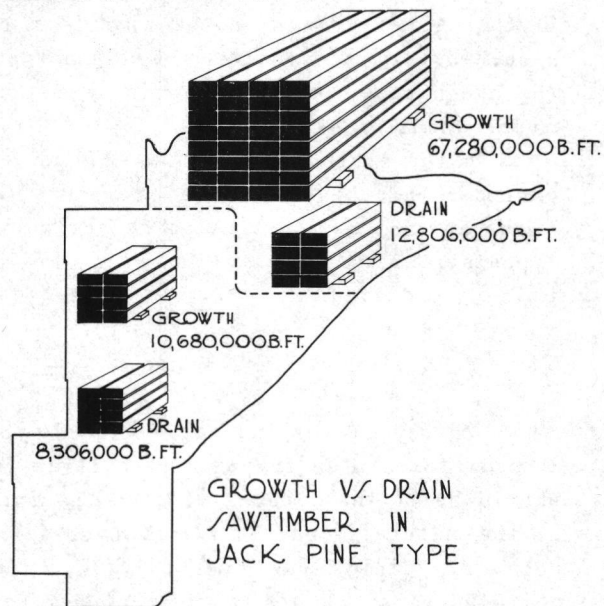
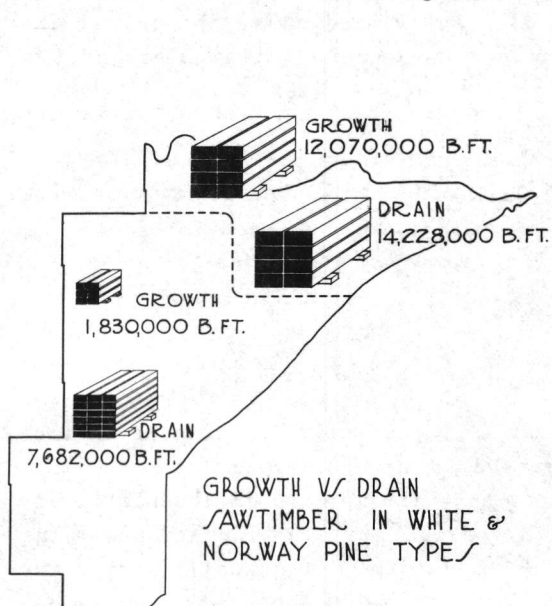
Timber growth in the Cloquet - Superior District is adequate in amount but inferior in quality and poorly located.

The 204,830,000 board feet estimated to be growing annually in the entire district is 50 percent greater than the current rate of depletion by logging, fire and other agencies. The estimated gross growth in cubic feet averaging 22 cubic feet per acre or 145,740,000 cubic feet (roughly 2 million cords) is likewise 50 percent greater than the present rate of depletion. (Table 20)

In the white and Norway pine types, the types which up to the present time have furnished the bulk of the commercial sawtimber, drain exceeds growth in all parts of the district. (Table 20) Likewise, in the hardwood and spruce-balsam types, depletion is more rapid than growth. The coniferous swamps on the whole



# GROWTH AND CONSUMPTION OF TIMBER IN CLOQUET-SUPERIOR DISTRICT



are about self sustaining. In the aspen and miscellaneous types where there has been relatively little commercial logging, growth exceeds current drain.

In the heavily exploited southern and central divisions, sawtimber depletion is four times growth in the white and Norway pine types, and twice the growth in spruce-balsam and coniferous swamp types. But even here growth exceeds drain on the aspen type, particularly in terms of total cubic volume. Jack pine and hardwoods about break even.

In the northern division, except in the white and Norway pine types, growth exceeds drain by substantial margins. In fact, jack pine sawtimber is growing five times as fast as it is being cut or burned and in the spruce and spruce-balsam types slight surpluses of pulpwood are accumulating. Aspen growth is more than twice the drain.

#### Timber Available For Cutting

Not all of the indicated growth will be actually available for cutting in the immediate future. In fact, if cutting is restricted to merchantable stands as it should be if the productivity of the forest is to be built up, and if the harvesting of the mature stands is spread over a fairly long period with the idea of providing permanent yields, not over 187,480,000 board feet should be cut annually during the next 40 years. (Table 19) The timber available for cutting in the white and Norway pine types would be only 8,180,000 board feet annually, about 50 percent of the present cut. The cut in aspen sawtimber could be increased four-fold.

The prospective sawtimber volume available for cutting in the northern division is five times the present cut while on the southern and central divisions, 50 percent more timber is being cut than promises to be available annually for the next 40 years.

#### Accessibility

The long-run outlook for forest industries in the Cloquet - Superior District is affected by proximity of this region to the ultimate market for lumber and paper, and, secondly, by the accessibility of raw materials to the mills.

Extensive highway developments, several common carrier railroads, a logging railroad which extends from Cloquet northeast to a point near the Canadian border in Cook county, and the possibilities of water transportation make the largest share of the forest lands and timber of the Cloquet - Superior District physically accessible. Only the most remote sections of the Superior National Forest may be said to be beyond the reach of present transportation facilities. Actual availability, however, is often less a matter of physical than of economic accessibility.

The lumber and paper market in the Middle West is today a highly competitive field. Lumber, poles and piling from the Pacific Coast now invade the Lake States in quantity. Southern pine and southern hardwoods, logged and manufactured with cheap labor, are able to overcome freight handicaps and compete in the southern part of this region. Paper made from southern pines is becoming an increasing factor in the kraft market and threatens to invade the newsprint field.

Northern mills such as those at Cloquet, however, have certain natural market advantages, the most important of which is nearness to large wood consuming centers. For instance, to Chicago, lumber from the Pacific Coast costs \$14.40 per ton for freight, that from Florida \$7.80, from Arkansas \$6.70.\* The rate from Cloquet

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\* Southern and western softwoods run about 1¼ tons per thousand board feet--northern white pine about 1 ton.



is only \$3.70. To Minneapolis and St. Paul the advantage is even more marked.

Freight on newsprint to Chicago from the Pacific Coast amounts to \$20.60 per ton, from Tonawanda, N. Y. \$5.00. From Cloquet it is \$4.30.

It appears then that Cloquet has an advantage of from \$3 to \$14 per thousand and board feet in lumber and from 70¢ to \$16 per ton in newsprint over its principal competitors.

Other factors, such as abundance of supply and ease of conversion in western woods and cheap labor in the South, favor the competing regions. The final advantage will depend in a large measure upon the availability of cheap raw materials.

It may help to understand the relative availability of timber stands in northern Minnesota to quote a few selected figures on transportation costs of wood from the various divisions into Cloquet.

#### COST OF TRANSPORTING WOOD TO CLOQUET

From	App. Miles	Per Cord of Pulpwood 1	Per Thousand Feet of Sawlogs 2	Method of 3 Transportation
SOUTHERN DIVISION				
Sawyer	15	\$1.00		Truck
Moose Lake	25	1.50	\$3.00	Truck
Floodwood	40	2.00		Truck
McGregor	45	1.98		Rail
Meadowlands	45	2.15	3.07	Rail
CENTRAL DIVISION				
Chisholm	80	1.98		Rail
Gheen	100	2.48		Rail
Beaver Bay	65	3.00		Truck
NORTHERN DIVISION				
Cook Co.	140	3.73	7.76	Rail
Canadian Line 4	150	3.96	8.25	Rail
OUTSIDE OF DISTRICT				
Bemidji	150	3.30		Rail

Wood within a radius of 15 miles can be trucked in at a cost of about \$1 per cord, and within 50 miles on good roads at around \$2.00 per cord. In going into the central division freight costs rise to an average of around \$2.50, to which should be added at least \$1.00 a cord on the average for trucking to the railroad.

1 Figured at 3,300 lbs. per cord.

2 Figured at 6,900 lbs. per MBF.

3 With rail transportation, 50¢ per cord, or \$1.00 per thousand in addition to actual freight has been included as a handling charge.

4 Freight figured at 1.4¢ per ton mile.

In the northern division primary freight comes to \$3 or \$4 per cord. On account of rough topography and lack of roads in the extreme limits of the district, logging costs are high. The cost of assembling material in quantity on rail sidings is very large. Logging and transportation costs in the lower part of the northern district are comparable to those in the central area.

The cost of transporting freshly cut logs ranges from an average of \$3.00 in the nearby district to \$8.25 in the northern area.

It may be fairly concluded that the transportation cost from stump to mill from the northernmost limits of the Cloquet - Superior District will, in the case of the Cloquet industries, offset much of the advantage of proximity of the mill to market under present market conditions. Only the choicest pine sawtimber and spruce pulpwood can stand this haul.

Pulpwood from the territory adjacent to the North Shore of Lake Superior and to a lesser extent, that along the Pigeon River has in the past been transported by water to points in Wisconsin, Canada and eastern states. Advantages of water transportation tend to be offset by the difficulties of loading or raft construction and the added cost of rehandling the wood trucked out from the woods. Lack of roads in the upper north shore area hampers easy access to many of the pulpwood stands.

Further depletion of western timber, changes in general freight rates, improvements in lumber and paper markets, and other factors can change the situation greatly but will not alter the relative standing of the different divisions in respect to accessibility to Cloquet.

### Conclusions

A logical long-time program to improve the balance between supplies and wood requirements in the Cloquet - Superior District would seem to embrace the following steps:

1. Some curtailment in use of white and Norway pine sawtimber (or importation of logs from without the unit.)
2. New industries or expansion of present industries using jack pine, aspen and paper birch.
3. Coordination of ownership and management plans to make existing material available to industries on a permanent basis.
4. Better forest management on private lands. In particular, elimination of cutting of immature spruce and jack pine on areas adjacent to mills.
5. Greater public aid in restoring forests of southern and central divisions adjacent to existing industries. This will involve (1) expansion of public forests, (2) intensification of management on most accessible and productive areas, (3) cooperation with private owners in fire protection, forest credits, forest taxation and management plans.

These various measures seem economically feasible and socially desirable. The number of communities and farms dependent upon the maintenance of going forest industries in this part of northern Minnesota justifies giving serious thought and effort to working out a plan for their permanent operation.



TABLE 1  
PRIMARY WOOD-USING INDUSTRIES  
NUMBER OF MILLS, EMPLOYMENT AND PRODUCTION  
CLOQUET - SUPERIOR DISTRICT  
Minnesota 1934

Type of Mill	No. of Mills	No. of Men Employed 1933	Output 1933	Percent of 1929 - 1933 Average
SAWMILLS (By Size)				
5 MM BF	4	310	27,823 MBF*	49.5%
1-5 MM	5	40	2,672 "	46.6%
100M-1000M	70	282	12,381 "	64.4%
Under 100M	76	212	1,932 "	73.0%
All Sawmills	155	844	44,808 "	53.5%
Cooperage Mills	0			
Excelsior Mills	0			
Lath Mills	5	16	M Pieces: 1,750	56.5%
Match Factories	1	550 ***	14,492 Cords**	100.0%
Pulp Mills	2	397 ***	101,866 Cords**	100.0%
Shingle Mills	6	19	M Pieces: 957	99.5%
	169	1,826		

\* Lumber scale.

\*\* Amount of wood used.

\*\*\* Statistics on employment during 1935 show 1234 men employed in pulpmills and close to 1,000 in the match factory.

TABLE 2  
LUMBER PRODUCTION BY SPECIES - 1933

Species	Entire District		Southern and Central Division		Northern Division	
	1933 Pro- duction	% of 5-yr. Ave.*	1933 Pro- duction	% of 5-yr. Ave.*	1933 Pro- duction	% of 5-yr. Ave.*
	MBM		MBM		MBM	
White Pine	22,655		21,506		1,149	
Balsam	3,778		3,533		245	
Spruce	2,198		2,101		97	
Jack Pine	1,285		1,285		-	
Norway Pine	1,272		1,242		30	
Cedar	626		370		256	
Tamarack	341		341		-	
Total Softwood	32,155		30,378		1,777	
Aspen	7,458		7,323		135	
Birch	3,793		3,700		93	
Oak	902		902			
Basswood	401		401			
Maple	57		57			
Elm	30		30			
Ash	12		12			
Total Hardwood	12,653		12,425		228	
	44,802	53.5	42,803**	52.7	2,005	77.2

\* 1929 - 1933 Inclusive.

\*\* Of this quantity, 19,028 MBM were cut from the Southern and Central Division, 17,168 MBM from the Northern Division and 6,607 MBM from outside the District.

TABLE 3  
CONSUMPTION OF PULPWOOD - 1933

Species	Entire District	Southern and Central Division	Northern Division
	Cords	Cords	Cords
Spruce	50,226	50,226	-
Balsam	5,723	5,723	-
Jack Pine	22,687	22,687	-
Aspen	23,230	23,230	-
	101,866	101,866	



**TABLE 4**  
**GENERAL CLASSIFICATION OF LAND**  
**CLOQUET - SUPERIOR DISTRICT**

Minnesota 1934

Class of Land*	Acres	Per Cent
<b>NON-FOREST AREA</b>		
Urban and Platted	118,000	1.5
Improved Farm	473,500	6.3
Rights-of-Way	71,900	1.0
Miscellaneous Industrial	43,000	.6
Open Bog or Marsh	174,800	2.3
Other Unused Open Land	178,400	2.4
Unsurveyed Waters	54,700	.7
Total Non-Forest	1,110,100	14.8
<b>FOREST AREA</b>	6,360,600	85.2
<b>GROSS LAND AREA</b>	7,470,700	100.0

\* Classes of land are defined as follows:

Improved Farm - Crop, fallow land and cleared pasture.

Rights-of-Way - Highways and railroads. Transmission lines are included where they do not parallel roads.

Miscellaneous Industrial - Legal sub-divisions embracing open-pit iron mines, gravel pits, resort sites, small unplatted settlements.

Unused Open Land - Naturally non-forest brush and grass areas, including alder brush and open natural meadows.

Unsurveyed Waters - Includes beaches and rock outcrop, but excludes small streams less than 2 rods wide.

TABLE 5  
AREA OF FOREST LAND  
BY COVER TYPES <sup>1/</sup>, CONDITION CLASS <sup>2/</sup> AND LOCALITY  
CLOQUET - SUPERIOR DISTRICT  
Minnesota 1934

FOREST COVER TYPE	ENTIRE DISTRICT				SOUTHERN DIVISION				CENTRAL DIVISION				NORTHERN DIVISION			
	All Classes	Saw-timber	Cord-wood	Re-stocking	All Classes	Saw-timber	Cord-wood	Re-stocking	All Classes	Saw-timber	Cord-wood	Re-stocking	All Classes	Saw-timber	Cord-wood	Re-stocking
PINE																
Jack Pine	676,300	204,200	257,200	214,900	13,300	--	3,100	10,200	108,200	19,700	58,000	30,500	554,800	184,500	196,100	174,200
Norway Pine	34,200	3,400	25,200	5,600	8,700	800	5,500	2,400	7,700	--	6,200	1,500	17,800	2,600	13,500	1,700
White Pine	113,500	36,000	68,800	8,700	5,600	800	2,400	2,400	10,100	1,600	5,400	3,100	97,800	33,600	61,000	3,200
Total Pine	824,000	243,600	351,200	229,200	27,600	1,600	11,000	15,000	126,000	21,300	69,600	35,100	670,400	220,700	270,600	179,100
UPLAND HARDWOODS																
Maple - Basswood	84,700	26,300	13,500	44,900	57,300	9,400	11,000	36,900	25,200	15,000	2,300	7,900	2,200	1,900	200	100
Oak	5,600	800	--	4,800	5,500	800	--	4,700	100	--	--	100	--	--	--	--
Total Hardwoods	90,300	27,100	13,500	49,700	62,800	10,200	11,000	41,600	25,300	15,000	2,300	8,000	2,200	1,900	200	100
BOTTOMLAND HARDWOODS	116,900	11,000	27,500	78,400	97,300	8,600	19,600	69,100	19,600	2,400	7,900	9,300	--	--	--	--
SPRUCE - BALSAM	534,800	47,200	231,200	256,400	137,300	4,700	54,900	77,700	288,800	35,400	94,900	158,500	108,700	7,100	81,400	20,200
CONIFEROUS SWAMP																
Spruce	792,700	8,400	266,400	517,900	127,100	--	7,800	119,300	226,200	1,600	36,200	188,400	439,400	6,800	222,400	210,200
Tamarack	107,600	--	14,200	93,400	69,800	--	13,300	56,500	37,800	--	900	36,900	--	--	--	--
Cedar	111,000	4,000	61,200	45,800	30,600	--	8,600	22,000	50,900	800	29,800	20,300	29,500	3,200	22,800	3,500
Non-productive <sup>3/</sup>	207,000	--	--	207,000	119,300	--	--	119,300	73,000	--	--	73,000	14,700	--	--	14,700
Total Swamp	1,218,300	12,400	341,800	864,100	346,800	--	29,700	317,100	387,900	2,400	66,900	318,600	483,600	10,000	245,200	228,400
MISCELLANEOUS																
Aspen - Birch	2,347,700	155,000	549,300	1,643,400	866,200	7,800	84,700	773,700	794,900	49,400	123,300	622,200	686,600	97,800	341,300	247,500
Scrub Oak	8,500	--	--	8,500	7,800	--	--	7,800	700	--	--	700	--	--	--	--
Deforested	1,220,100	--	--	--	747,800	--	--	--	393,100	--	--	--	79,200	--	--	--
Total Misc.	3,576,300	155,000	549,300	1,651,900	1,621,800	7,800	84,700	781,500	1,188,700	49,400	123,300	622,900	765,800	97,800	341,300	247,500
ALL COVER TYPES	6,360,600	496,300	1,514,500	3,129,700	2,293,600	32,900	210,900	1,302,000	2,036,300	125,900	364,900	1,152,400	2,030,700	337,500	938,700	675,300

<sup>1/</sup> Stands are classified into forest cover types according to the dominance of the various species.  
Jack pine cover type includes stands consisting of 50 per cent or more of this species.

<sup>2/</sup> Four condition classes were recognized:

Sawtimber stands are those having 2000 bd. ft. or more of timber suitable for sawlogs. Only trees 9.0 inches or larger at breast height are considered suitable for sawtimber.

Cordwood stands are those having 3 cords or more per acre of trees 5.0 inches or larger, exclusive of sawtimber trees.

Restocking areas have at least 10 per cent of ground occupied by trees less than 5.0 inches in diameter.

Deforested areas do not qualify for either of the above three classes, but are forest lands.

<sup>3/</sup> Non-productive swamps are those which will not produce trees at least 5 inches in breast height diameter in 100 years.



TABLE 6

## OWNERSHIP OF FOREST LAND

## CLOQUET - SUPERIOR DISTRICT

OWNER CLASS*	ENTIRE DISTRICT		SOUTHERN & CENTRAL DIVISIONS		NORTHERN DIVISION	
	Acres	Percent	Acres	Percent	Acres	Percent
Federal	1,193,410	18.76	178,060	5.34	1,015,350	50.00
State & County	805,990	12.67	518,770	11.46	287,220	14.14
Indian	26,860	.42	16,380	0.33	10,480	.52
Large Private	2,018,850	31.74	1,547,980	32.29	476,870	23.19
Small Private	2,315,490	36.41	2,068,710	50.58	246,780	12.15
Total	6,360,600	100.00	4,329,900	100.00	2,030,700	100.00

## \* Ownership Classes:

Federal - National Forest and Vacant Public Domain, including unallotted Indian Reservation lands.

Indian - Lands held in trust for Indians. Does not include patented allotments.

State - Unsold and reverted grant lands; lands under contract of sale which are delinquent in interest payments for two or more years; Rural Credits ownership; reforestation and flood control lands.

County - County owned land other than highways.

Large Private - Owners of at least 1,800 acres. Ownership assumed to rest with whom-ever paid the taxes for 1932.

Small Private - Owners of less than 1,800 acres.

## NOTES ON TABLE 7

1. Living trees only are included in all volume estimates.
2. Sawtimber is scaled by the Scribner Dec. C Log Rule. The volume includes trees 9.0 inches or more in diameter at breast height which would yield a 10-foot log of high quality or a 16-foot log of inferior quality, having a diameter at the small end of not less than 8 inches in hardwoods or 6 inches in softwoods.
3. Pulpwood includes wood of suitable species and quality, exclusive of sawtimber, which occurs in trees producing at least two 8-foot sticks. Pulpwood in tops of sawtimber trees and in small trees is included again in the cordwood estimate.
4. Cedar poles are at least 16 feet long, the majority 16 to 25 feet long.
5. Cedar posts are 7 feet long. Split posts are not commonly utilized in this district. The material is suitable for lagging.
6. Cordwood is measured in terms of standard cords, 4 X 4 X 8'. Small trees include those 5.0 inches or larger at breast height which are unsuitable for sawtimber. The volume of the stump and all wood less than 4.0 inches in diameter is excluded.

Tops and limbs includes non-sawlog material to a 4-inch top in merchantable sawtimber trees. Limbs are excluded in softwood species.

Cordwood in small trees and tops includes pulpwood.

Cull includes the entire volume to a 4-inch top of trees unsuitable for either sawtimber or pulpwood and which can never attain merchantability because of form or defect.
7. Cubic volume of sawtimber and cedar products was derived by direct computation. The cubic volume of the cordwood material is expressed by the following ratios of cubic feet per cord:

Small trees, 72; Tops and Limbs, 60; Cull, 67.



TABLE 7

## SUMMARY OF TIMBER VOLUME /

## CLOQUET - SUPERIOR DISTRICT

Minnesota 1934

Products		In Customary Units of Measure		Converted to Cubic Feet 7
		Unit	Volume	Thous. Cu. Ft.
Sawtimber	2	M Bd. Ft.	4,266,640	854,110
Pulpwood	3	Cords	9,397,000	---
Poles (Cedar)	4	Pieces	3,798,000	33,850
Posts (Round Cedar)	5	Pieces	6,650,000	18,010
Posts (Split Cedar)		Pieces	8,392,000	5,840
Cordwood	6			
Small Trees		Cords	17,960,000	1,292,940
Tops & Limbs		Cords	5,390,000	323,430
Cull		Cords	4,044,000	264,800
Total				2,792,980

**TABLE 8**  
**VOLUME OF SAWTIMBER**  
**BY SPECIES, CONDITION CLASS & LOCALITY**  
**CLOQUET - SUPERIOR DISTRICT**  
**Minnesota 1934**

Species Group	In All Stands	In Sawtimber Stands <sup>1</sup>	Scattered on Cut-over Lands
	MBF	MBF	MBF
ENTIRE DISTRICT			
Pines	2,118,460	1,470,300	648,160
Other Softwoods <sup>2</sup>	599,410	134,360	465,050
Aspen	873,640	527,810	345,830
Birch <sup>3</sup>	512,140	187,020	325,120
Misc. Hardwoods	162,990	65,040	97,950
All Species <sup>4</sup>	4,266,640	2,384,530	1,882,110
SOUTHERN & CENTRAL DIVISION			(UNIT I)
Pines	209,870	139,480	70,390
Other Softwoods	122,310	43,100	79,210
Aspen	221,810	110,580	111,230
Birch	214,380	136,240	78,140
Misc. Hardwoods	118,820	62,590	56,230
All Species	887,190	491,990	395,200
NORTHERN DIVISION			(UNIT IV)
Pines	1,908,590	1,330,820	577,770
Other Softwoods	477,100	91,260	385,840
Aspen	651,830	417,230	234,600
Birch	297,760	50,780	246,980
Misc. Hardwoods	44,170	2,450	41,720
All Species	3,379,450	1,892,540	1,486,910

<sup>1</sup> Stands of 2M board feet per acre or more.

<sup>2</sup> Principally white spruce and balsam fir.

<sup>3</sup> Yellow and paper birch.

<sup>4</sup> Sugar maple, basswood, elm, oak, black ash, etc.

TABLE 9

## VOLUME OF PULPWOOD IN THREE DIVISIONS

## OF CLOQUET - SUPERIOR DISTRICT

Minnesota 1934

Volume in Standard Cords /

Species	Entire District	Southern Division	Central Division	Northern Division
	Thousands	Thousands	Thousands	Thousands
Pine	3,861	108	494	3,259
Spruce	2,958	80	225	2,653
Balsam Fir	1,235	288	463	484
Tamarack	13	3	1	9
Aspen	1,330	226	366	738
All Species	9,397	705	1,549	7,143

/ See Table 7 for specifications for pulpwood.

TABLE 10

## VOLUME OF PINE SAWTIMBER IN THREE DIVISIONS

## OF CLOQUET - SUPERIOR DISTRICT

Minnesota 1934

Volume in Thousand Board Feet /

Species	Entire District	Southern Division	Central Division	Northern Division
Jack Pine	1,463,160	9,450	112,290	1,341,420
Norway Pine	205,420	14,590	14,630	176,200
White Pine	449,880	21,070	37,840	390,970
All Pine	2,118,460	45,110	164,760	1,908,590

/ See Table 7 for specifications for sawlogs.



TABLE 11

## TIMBER OWNERSHIP BY SPECIES GROUPS

## CLOQUET - SUPERIOR DISTRICT

## Ownership of All Sawtimber

Owner Class	All Species	Norway and White Pines	Jack Pine	Spruces and other Conifers	Aspen and other Hardwoods
	m.b.f.	m.b.f.	m.b.f.	m.b.f.	m.b.f.
Federal	1,634,550	175,680	717,920	233,670	507,280
State	477,320	44,200	161,020	82,480	189,620
Indian	19,130	1,920	7,920	2,610	6,680
County	2,330	160	180	180	1,810
Large Private	1,303,640	348,210	352,860	168,120	434,450
Small Private	829,670	85,130	223,260	112,350	408,930
Total	4,266,640	655,300	1,463,160	559,410	1,548,770

## Ownership of Pine Sawtimber

Owner Class	Entire District	Southern & Central Division	Northern Division
	m.b.f.	m.b.f.	m.b.f.
Federal	893,600	27,010	866,590
State	205,220	23,060	182,160
Indian	9,840	900	8,940
County	340	280	60
Large Private	701,070	60,870	640,200
Small Private	308,390	97,750	210,640
Total	2,118,460	209,870	1,908,590

## Ownership of Spruce Pulpwood

	Thousand Cords	Thousand Cords	Thousand cords
Federal	1,321	15	1,306
State	424	44	380
Indian	13		13
County			
Large Private	750	112	638
Small Private	450	134	316
Total	2,958	305	2,653

TABLE 12  
AVERAGE VOLUME OF TIMBER PER ACRE  
BY FOREST COVER TYPES (1) AND CONDITION CLASSES (2)  
CLOQUET - SUPERIOR DISTRICT  
Minnesota 1934

FOREST COVER TYPE	SAWTIMBER STANDS		CORDWOOD STANDS		RESTOCKING AREAS	
	Bd.Ft.	Cu.Ft. (3)	Bd.Ft.	Cu.Ft.	Bd.Ft.	Cu.Ft.
PINE						
White Pine	6,456	1,776	2,225	1,328	328	270
Norway Pine	23,429	4,868	2,081	966	114	134
Jack Pine	6,003	2,430	713	886	177	149
UPLAND HARDWOODS						
Maple - Basswood	2,323	1,003	629	573	213	155
Oak	1,500	89	---	---	94	71
BOTTOMLAND HDWDS.	2,667	1,218	439	495	188	174
SPRUCE - BALSAM	3,249	1,497	1,070	683	273	196
CONIFEROUS SWAMP						
Spruce	3,390	1,582	1,098	1,040	58	92
Tamarack	---	---	94	412	2	17
Cedar	615	2,563	613	1,170	106	182
Non-productive	---	---	---	---	1	4
MISCELLANEOUS						
Aspen - Birch	3,682	1,469	1,020	767	69	72
Scrub Oak	---	---	---	---	76	44

(1) See Table 5 for definition of forest cover type.

(2) See Table 5 for definition of condition classes.

(3) Cubic foot volume includes all merchantable products as well as tops and limbs of sawtimber trees to a 4 inch minimum diameter and un-merchantable trees 5.0 inches or larger at breast height.

TABLE 13  
VOLUME OF TIMBER  
BY FOREST COVER TYPE AND PRODUCTS \*

CLOQUET - SUPERIOR DISTRICT

Minnesota - 1934

FOREST COVER TYPE	Sawtimber		Pulpwood		Total Volume**	
	MBF	%	M Cords	%	M Cu.Ft.	%
PINE						
White Pine	388,350	9.10	305	3.25	157,630	6.14
Norway Pine	132,750	3.11	51	.54	41,650	1.62
Jack Pine	1,447,390	33.92	3,487	37.11	756,040	29.47
Total Pine	1,968,490	46.14	3,843	40.89	955,320	37.24
UPLAND HARDWOODS						
Maple - Basswood	79,130	1.86	24	.25	41,070	1.60
Oak	1,650	.04			1,050	.04
Total Hardwoods	80,780	1.89	24	.25	42,120	1.64
BOTTOMLAND HARDWOODS	56,130	1.32	40	.43	40,670	1.59
SPRUCE - BALSAM	470,680	11.03	838	8.92	278,980	10.88
CONIFEROUS SWAMP						
Spruce	351,230	8.23	2,422	25.77	338,120	13.18
Tamarack	1,500	.04	4	.04	7,430	.29
Cedar	44,860	1.05	123	1.31	90,180	3.52
Non-productive	140		1	.01	910	.04
Total Swamp	397,730	9.32	2,550	27.14	436,640	17.02
MISCELLANEOUS						
Aspen - Birch	1,243,470	29.14	1,978	21.05	767,250	29.91
Scrub Oak	650	.02			370	.01
Deforested	48,710	1.14	124	1.32	43,810	1.71
Total Misc.	1,292,830	30.30	2,102	22.37	811,430	31.63
ALL COVER TYPES	4,266,640	100.0	9,397	100.0	2,565,160	100.00

\* See Table 7 for definitions of products, and Table 5 for definition of forest cover types.

\*\* Total Volume excludes cull trees.



TABLE 14

ANNUAL GROWTH (1) OF TIMBER  
BY FOREST COVER TYPES AND PRODUCTS  
CLOQUET - SUPERIOR DISTRICT  
Minnesota - 1934

FOREST COVER TYPE	SAWTIMBER(2)		PULPWOOD(3)		TOTAL VOLUME(4)	
	Per Acre Bd.Ft.	Total M Bd.Ft.	Per Acre Cords	Total Cords	Per Acre Cu.Ft.	Total M Cu.Ft.
PINE						
White Pine	80	9,030	.09	10,000	41	4,710
Norway Pine	142	4,870	.15	5,000	61	2,100
Jack Pine	115	77,960	.24	162,000	36	24,480
All Pine	111	91,860	.21	177,000	38	31,290
UPLAND HARDWOODS						
Maple - Basswood	27	2,260		*	14	1,200
Oak	11	60			14	80
All Hardwoods	26	2,320		*	14	1,280
BOTTOMLAND HDWDS.	25	2,920	.02	2,000	17	1,970
SPRUCE - BALSAM	35	18,960	.10	53,000	31	16,490
CONIFEROUS SWAMP						
Spruce	16	12,460	.11	90,000	19	14,920
Tamarack	3	300	.01	1,000	6	690
Cedar	7	810	.02	2,000	15	1,690
Non-productive			*	*	2	430
All Swamp	11	13,570	.08	93,000	15	17,730
MISCELLANEOUS						
Aspen - Birch	31	72,240	.09	219,000	31	73,640
Scrub Oak	2	20	*	*	4	30
Deforested	2	2,940	.00	5,000	3	3,310
All Misc.	21	75,200	.06	224,000	22	76,980
ALL COVER TYPES	32	204,830	.09	549,000	23	145,740

- (1) Periodic annual growth for next 10 years. See Table 5 for definition of Forest Cover Type and Table 7 for specifications of products.
- (2) Per acre figures have been rounded to nearest board foot, totals to nearest 10,000 board feet. These are net Scribner volumes (excluding cull).
- (3) Per acre figures are rounded to nearest hundredth cord, totals to nearest thousand and cords.
- (4) Includes sawtimber, pulpwood, and any additional volume between stump and 4 inch top. Per acre figures rounded to nearest cubic foot, totals to nearest 10,000 cu.ft.
- \* Negligible quantity

TABLE 15

## INDUSTRIAL AND DOMESTIC USE OF WOOD

## Average Annual Cut of Sawlog Material

	VOLUME - LOG SCALE (Scribner Rule)				Equivalent Cubic Feet of Standing Timber <sup>4</sup>
Forest Cover Type Group	Cut For Lumber <sup>1</sup>	Cut For Pulpwood <sup>2</sup>	Cut For Fuel <sup>3</sup>	Total Cut	
	MBF	MBF	MBF	MBF	M Cu. Ft.
ENTIRE DISTRICT					
White - Norway Pine	17,767	178	---	17,945	4,093
Jack Pine	9,261	1,085	74	10,420	3,074
Hardwoods <sup>5</sup>	4,623	330	181	5,134	1,779
Spruce - Balsam	17,715	4,501	285	22,501	6,638
Coniferous Swamp	4,525	5,214	3	9,742	3,180
Miscellaneous	22,218	2,038	770	25,026	7,551
ALL TYPES	76,109	13,346	1,313	90,768	26,315
SOUTHERN AND CENTRAL DIVISION					
White - Norway Pine	7,234	17	---	7,251	1,628
Jack Pine	6,872	156	64	7,092	2,092
Hardwoods	4,611	330	181	5,122	1,775
Spruce - Balsam	15,638	4,308	261	20,207	5,961
Coniferous Swamp	1,805	2,160	3	3,968	1,298
Miscellaneous	15,309	883	622	16,814	5,101
ALL TYPES	51,469	7,854	1,131	60,454	17,855
NORTHERN DIVISION					
White - Norway Pine	10,533	161	---	10,694	2,465
Jack Pine	2,389	929	10	3,328	982
Hardwoods	12	---	---	12	4
Spruce - Balsam	2,077	193	24	2,294	677
Coniferous Swamp	2,720	3,054	---	5,774	1,882
Miscellaneous	6,909	1,155	148	8,212	2,450
ALL TYPES	24,640	5,492	182	30,314	8,460

<sup>1</sup> Average cut 1929 - 1933.

<sup>2</sup> Cut 1933. Includes only volume suitable for sawlogs.  
See Table 16 for other pulpwood.

<sup>3</sup> Includes only sound live trees 9 inches or more in diameter.

<sup>4</sup> Includes volume of unused top and limbs 4 inches or more in diameter.

<sup>5</sup> Including bottomland hardwoods but excluding aspen and scrub oak.

TABLE 16

## INDUSTRIAL AND DOMESTIC USE OF WOOD

## CLOQUET - SUPERIOR DISTRICT

## Average Annual Cut of Timber Below Sawlog Size

Forest	EQUIVALENT CUBIC FEET STANDING TIMBER			
Cover	Cut For	Cut For	Cut For	Total
Type	Pulpwood <sup>1</sup>	Posts, etc. <sup>2</sup>	Fuel <sup>3</sup>	Cut
	M Cu. Ft.	M Cu. Ft.	M Cu.Ft.	M Cu.Ft.
ENTIRE DISTRICT				
White - Norway Pine	112	43	84	239
Jack Pine	1,009	243	324	1,576
Hardwoods <sup>4</sup>	193	108	297	598
Spruce - Balsam	2,162	352	682	3,196
Coniferous Swamps	2,254	817	163	3,234
Miscellaneous	1,710	262	2,579	4,551
ALL TYPES	7,440	1,825	4,129	13,394
SOUTHERN AND CENTRAL DIVISION				
White - Norway Pine	55	21	26	102
Jack Pine	844	200	192	1,236
Hardwoods	193	108	297	598
Spruce - Balsam	2,149	349	666	3,164
Coniferous Swamps	1,609	685	98	2,392
Miscellaneous	1,591	234	2,327	4,152
ALL TYPES	6,441	1,597	3,606	11,644
NORTHERN DIVISION				
White - Norway Pine	57	22	58	137
Jack Pine	165	43	132	340
Hardwoods	---	--	---	---
Spruce - Balsam	13	3	16	32
Coniferous Swamps	645	132	65	842
Miscellaneous	119	28	252	399
ALL TYPES	999	228	523	1,750

<sup>1</sup> Cut 1933. Includes only material too small or poor to make sawlogs.

<sup>2</sup> Estimated cut next 10 years.

<sup>3</sup> Includes only sound live trees 6 and 8 inches in diameter.

<sup>4</sup> Includes bottomland type but excludes aspen and scrub oak.



**TABLE 17**  
**ANNUAL RATE OF SAWTIMBER DEPLETION**  
**BY COVER TYPES / AND CLASSES OF DRAIN**  
**Minnesota 1934**

Forest Cover Type	Total Depletion MBF	Industrial & Domestic Utilization 2 MBF	Fire Damage 3 MBF	Other Losses 4 MBF
<b>PINE</b>				
White Pine	17,899	14,887	1,070	1,942
Norway Pine	4,011	3,058	289	664
Jack Pine	21,112	10,420	3,456	7,236
Total Pine	43,022	28,365	4,815	9,842
<b>UPLAND HARDWOODS</b>				
Maple - Basswood	3,195	3,024	137	34
Oak	225	221	3	1
Total Hardwoods	3,420	3,245	140	35
BOTTOMLAND HDWDS.	2,524	1,889	354	281
SPRUCE - BALSAM	29,340	22,501	4,486	2,353
<b>CONIFEROUS SWAMPS</b>				
Spruce	10,769	7,032	1,981	1,756
Tamarack	278	242	28	8
Cedar	2,917	2,468	226	223
Non-productive				
Total Swamps	13,964	9,742	2,235	1,987
<b>MISCELLANEOUS</b>				
Aspen	42,368	23,117	13,033	6,218
Scrub Oak	108	100	5	3
Deforested	2,951	1,809	899	243
Total Misc.	45,427	25,026	13,937	6,464
ALL TYPES	137,697	90,768	25,967	20,962

1 Cover Types are defined in Table 5.

2 From Table 15.

3 Fire damage is based upon state-wide average losses during the period 1924 - 1933. The annual loss amounts to less than 1 percent of the present volume.

4 Other losses are based upon state-wide average losses during the period 1900 - 1933 from disease, insect epidemics, tornadoes and losses connected with lumbering and land clearing. They average one-half of one percent of present volume.

TABLE 18  
ANNUAL RATE OF FOREST DEPLETION  
ALL KINDS OF MATERIAL  
BY FOREST COVER TYPES 1 AND CLASSES OF DRAIN 2  
CLOQUET - SUPERIOR DISTRICT  
Minnesota 1934

Forest Cover Type	Total	Industrial And Domestic Utilization	Fire Damage	Other Losses
	M Cu. Ft.	M Cu. Ft.	M Cu. Ft.	M Cu. Ft.
<b>PINE</b>				
White Pine	7,001	3,614	683	2,704
Norway Pine	1,672	718	150	804
Jack Pine	17,620	4,650	2,408	10,562
Total Pine	26,293	8,982	3,241	14,070
<b>UPLAND HARDWOODS</b>				
Maple - Basswood	1,629	1,308	156	165
Oak	105	95	5	5
Total Hardwoods	1,734	1,403	161	170
BOTTOMLAND HDWDS.	1,710	974	255	481
SPRUCE - BALSAM	17,273	9,834	3,778	3,661
<b>CONIFEROUS SWAMP</b>				
Spruce	10,773	4,506	2,314	3,953
Tamarack	523	350	96	77
Cedar	2,715	1,558	603	554
Non-productive	29		27	2
Total Swamp	14,040	6,414	3,040	4,586
<b>MISCELLANEOUS</b>				
Aspen - Birch	35,176	11,051	13,877	10,248
Scrub Oak	49	41	5	3
Deforested	2,548	1,010	1,022	516
Total Misc.	37,773	12,102	14,904	10,767
ALL COVER TYPES	98,823	39,709	25,379	33,735

1 See Table 5 for definition of forest cover type.

2 See Table 17 for definition of classes of drain.

This Table shows total depletion of merchantable wood in trees 5 inches and more in diameter at breast height, including tops and limbs to a 4 inch minimum diameter. Wastage incidental to lumbering, normal fire damage, and other losses are included.

TABLE 19

COMPARISON OF INDUSTRIAL AND DOMESTIC USE OF WOOD  
WITH AVERAGE AMOUNTS AVAILABLE FOR CUTTING  
DURING NEXT 40 YEARS  
CLOQUET - SUPERIOR DISTRICT  
Minnesota 1934

Cover Type Group	SAWTIMBER		TOTAL CUBIC VOLUME	
	Ave. Vol.	Ave. Annual	Ave. Vol.	Ave. Annual
	Available <sup>1</sup>	Cut <sup>2</sup>	Available <sup>1</sup>	Cut <sup>3</sup>
	Annually MBF	MBF	Annually M Cu. Ft.	M Cu.Ft.
ENTIRE DISTRICT				
White-Norway Pine	8,180	17,945	2,070	4,332
Jack Pine	48,820	10,420	16,810	4,650
Hardwoods	3,290	5,134	1,170	2,377
Spruce-Balsam	17,210	22,501	7,060	9,734
Coniferous Swamp	11,640	9,742	9,060	6,414
Miscellaneous	98,290	25,026	24,700	12,102
ALL TYPES	187,430	90,768	60,870	39,709
SOUTHERN AND CENTRAL DIVISIONS				
White-Norway Pine	860	7,251	220	1,730
Jack Pine	8,630	7,092	3,500	3,328
Hardwoods	3,140	5,122	1,130	2,373
Spruce-Balsam	9,610	20,207	5,180	9,125
Coniferous Swamp	1,300	3,968	2,020	3,690
Miscellaneous	14,730	16,814	8,460	9,253
ALL TYPES	38,270	60,454	20,510	29,499
NORTHERN DIVISION				
White-Norway Pine	7,320	10,694	1,850	2,602
Jack Pine	40,190	3,328	13,310	1,322
Hardwoods	150	12	40	4
Spruce-Balsam	7,600	2,294	1,880	709
Coniferous Swamp	10,340	5,774	7,040	2,724
Miscellaneous	83,560	8,212	16,240	2,849
ALL TYPES	149,160	30,314	40,360	10,210

<sup>1</sup> One fortieth of present volume plus estimated growth up to time of cutting for all stands which reach merchantable size during next 40 years and which can be cut without impairing the growin capacity of the forest. All present saw-timber stands are included. Actually 20% or more of sawtimber may be reserv-  
ed or will remain commercially inaccessible.

<sup>2</sup> From Table 15.

<sup>3</sup> From Table 15 and 16.



TABLE 20

## COMPARISON OF GROWTH WITH TOTAL RATE OF DEPLETION

## SAWTIMBER AND TOTAL VOLUME

## CLOQUET - SUPERIOR DISTRICT

Minnesota 1934

Cover Type Group	SAWTIMBER		TOTAL CUBIC VOLUME <sup>1</sup>	
	Growth <sup>2</sup>	Depletion <sup>3</sup>	Growth <sup>2</sup>	Depletion <sup>3</sup>
	MBF	MBF	M Cu. Ft.	M Cu. Ft.
ENTIRE DISTRICT				
White - Norway Pine	13,900	21,910	6,810	8,673
Jack Pine	77,960	21,112	24,480	17,620
Hardwoods <sup>4</sup>	5,240	5,944	3,250	3,444
Spruce - Balsam	18,960	29,340	16,490	17,273
Coniferous Swamps <sup>5</sup>	13,570	13,964	17,730	14,040
Miscellaneous	75,200	45,427	76,980	37,773
ALL TYPES	204,830	137,697	145,740	98,823

## SOUTHERN AND CENTRAL DIVISIONS

White - Norway Pine	1,830	7,682	1,410	2,249
Jack Pine	10,680	8,306	4,630	5,134
Hardwoods <sup>4</sup>	5,120	5,910	3,220	3,413
Spruce - Balsam	11,590	24,796	12,030	14,807
Coniferous Swamps <sup>5</sup>	2,190	4,498	6,200	5,628
Miscellaneous	25,830	24,347	41,540	22,000
ALL TYPES	57,240	75,539	69,030	53,231

## NORTHERN DIVISION

White - Norway Pine	12,070	14,228	5,400	6,424
Jack Pine	67,280	12,806	19,850	12,486
Hardwoods <sup>4</sup>	120	34	30	31
Spruce - Balsam	7,370	4,544	4,460	2,466
Coniferous Swamps	11,380	9,466	11,530	8,412
Miscellaneous	49,370	21,080	35,440	15,773
ALL TYPES	147,590	62,158	76,710	45,592

<sup>1</sup> Includes sawtimber, pulpwood, and any other volume between stump and 4 inch top.

<sup>2</sup> Expected annual growth next 10 years.

<sup>3</sup> Average industrial and domestic cut 1929-1933 plus allowance for fire and other losses (Tables 17 - 18).

<sup>4</sup> Including Bottomland types but excluding aspen and scrub oak.

<sup>5</sup> Including black spruce, tamarack and cedar.